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## Ground Water Monitoring Report

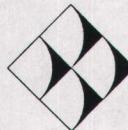


### June 2002 Monitoring Event

**Red Rock Construction & Demolition Debris Landfill  
Holly Springs, North Carolina  
NC Solid Waste Permit # 92-28**

Prepared for:  
**Waste Industries, Inc.**  
3301 Benson Drive Suite 601  
Raleigh, NC 27609

September 2002



**G.N. Richardson & Associates, Inc.**  
Engineering and Geological Services  
425 North Boylan Avenue  
Raleigh, North Carolina 27603

No VOCs

## **Red Rock C&D Landfill**

### **Ground Water Monitoring Report June 2002 Monitoring Event**

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#### **APPENDICES**

Appendix A – Laboratory Analytical Report

## **1.0 Introduction**

On June 11 2002, Environment 1 Laboratory personnel performed the required semi-annual detection monitoring ground water sampling event at the Red Rock C&D Landfill. This sampling event satisfies the requirements of the detection monitoring program under Solid Waste Permit # 92-28. The following report summarizes the monitoring event, sampling procedures, field and laboratory results, and ground water characterization as required by NC Solid Waste Regulations. Also included are summary tables of ground water measurements, field parameters, and detected constituents, and the laboratory analytical report.

## **2.0 Sampling Procedures**

Ground water sampling was performed at 7 well locations. In addition, semi-annual surface water monitoring was performed at one (1) location down stream of the landfill. Please note that the upgradient surface water sample for the site (SW-1) could not be collected, as this area was dry. The monitoring locations are shown on **Figure 1**.

Sampling procedures followed the protocols set forth in the site's Water Quality Monitoring Plan and the North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities. Each well was gauged to determine ground water depth and then purged of three to five well volumes or until dry. The wells were purged and allowed to stabilize prior to sample collection. Ground water purging and sample collection were performed using a laboratory cleaned, dedicated, bailer.

Field measurements of pH, specific conductivity, temperature, and turbidity were taken at each well and surface water sampling location. Field meters were calibrated prior to sampling. Samples were collected in laboratory containers provided by Environment 1, Inc. (NC Laboratory Certification # 10). Upon collection, the samples were sealed, placed on ice, and transported to the laboratory. Field blanks were also collected for quality control purposes.

During the sampling process, each well was inspected for signs of damage or unusual conditions. All wells were found to be in good condition and free of obstructions.

The weather was sunny and approximately 90 degrees Fahrenheit during the event. No rainfall occurred immediately prior to or during the monitoring event.

Samples from surface water points SW-2 and SW-3, located downstream of the landfill, were collected during ground water sample collection. Surface water point SW-1 was not collected, as this area was dry. The surface water locations are show in **Figure 1**.

## **3.0 Field and Laboratory Results**

All samples were transported to the laboratory facility under proper chain of custody analyzed at

the specified DWM Practical Quantitation Limits for Appendix I constituents. The laboratory analysis is included in **Appendix A**.

Ground water and field measurements are included as **Tables 1 and 2** respectively. The laboratory analysis detected no Appendix I organic compounds. Inorganic laboratory analysis detected three inorganic constituents (barium, chromium and lead) in the ground water samples. Although some of these inorganic constituents were detected at levels above their respective 2L ground water standard (NCAC T15A:2L.0202(g)) this is likely due to turbidity in the water from the wells.

Analysis of surface water samples indicated detectable levels of total chromium and lead in the sample from SW-2. These levels are also likely due to turbidity in the water sample.

#### **4.0 Ground Water Characterization**

A potentiometric surface map was prepared from ground water elevation data collected during this sampling event. Ground water velocity was calculated for each monitoring well on-site using the equation  $V = (KI)/n$  where:

K = hydraulic conductivity

I = ground water gradient

n = porosity

Ground water velocities ranged from .0312 feet/day (MW-10) to 4.301 feet/day (MW-3). These calculations are included in **Table 3**. Ground water at the C&D landfill is migrating toward the south, east and west. The potentiometric surface for the C&D landfill is included as **Figure 2**.

#### **5.0 Conclusions**

The results of this monitoring event confirm that the ground water quality around the Red Rock C&D Landfill has not been impacted by the facility. The detected inorganic results are likely due to suspended solids in the samples, not actual dissolved inorganic parameters.

The next detection monitoring event is tentatively scheduled for November 2002. The results of this event will be included in the Fall Ground Water Monitoring Report. These samples will be analyzed for the full suite of Appendix I constituents.

**Figure**

Drawings Under Separate Cover

**Table 1**  
**Ground Water Elevations**  
**Red Rock C&D Landfill**  
06/11/02

Well	Top of Casing	Depth to Water	Water Table Elevation
MW-1	280.60	27.49	253.11
MW-2T	281.19	26.16	255.03
MW-3	261.80	13.47	248.33
MW-4	254.10	7.53	246.57
MW-5	254.47	7.25	247.22
MW-6T	289.21	19.47	269.74
MW-10	301.16	14.36	286.80

**Table 2**  
**Field Parameters**  
**Red Rock C&D Landfill**  
06/11/02

Well	pH (std units)	Sp. Conductivity (uS)	Temperature (degrees C)
MW-1	7	2300	17
MW-2T	6.3	2200	16
MW-3	6.8	4300	15
MW-4	5.5	270	16
MW-5	5.8	810	15
MW-6T	7.1	3700	19
MW-10	7	620	16
SW-1	NM	NM	NM
SW-2	7.7	140	20
SW-3	6.5	120	21

SW-3 was dry at the time of sampling.

NM = not measured.

Measurement of temperature not taken due to equipment malfunction

Measurement for MW-4 is actually the measurement from MW-1d at the lined landfill (MW-1s did not contain enough water to sample).

for conductivity also

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**Table 3**  
**Ground Water Velocity Calculations**  
**Red Rock C&D Landfill**  
06/11/02

Parameter Units	Hydraulic Conductivity feet/min	Porosity %	Hydraulic Gradient feet/foot	Velocity feet/min	Velocity feet/day
MW-1	3.760E-04	0.10	0.060	2.256E-04	3.249E-01
MW-2T	NA	0.10	0.062	NA	NA
MW-3	5.150E-03	0.10	0.058	2.987E-03	4.301E+00
MW-4	NA	0.10	0.050	NA	NA
MW-5	1.430E-04	0.10	0.049	7.007E-05	1.009E-01
MW-6T	NA	0.10	0.038	NA	NA
MW-10	1.970E-04	0.10	0.011	2.167E-05	3.120E-02

Notes      Velocity calculated from  $V=KI/n$   
V = Velocity  
K = Hydraulic Conductivity  
I = Gradient  
n = Porosity  
Hydraulic conductivity data from slug testing

# Environment 1, Incorporated

P.O. BOX 7085, 114 OAKMONT DRIVE  
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208  
FAX (252) 756-0633

Drinking Water ID: 37715  
Wastewater ID: 10

ID#: 6011

RED ROCK LANDFILL (C&D)

MS. JOAN SMYTH

G.N. RICHARDSON & ASSOCIATES  
425 N. BOYLAN AVENUE  
RALEIGH , NC 27603

DATE COLLECTED: 06/11/02  
DATE REPORTED : 07/05/02

REVIEWED BY:

PARAMETERS	Monitoring Well #1	Monitoring Well #2T	Monitoring Well #3	Monitoring Well #4	Monitoring Well #5	Analysis Date	Analyst	Method Code
PH (field measurement), Units	7.0	6.3	6.8	5.5	5.8	06/11/02	RJH	EPA150.1
Arsenic, mg/l	<0.010	<0.010	<0.010	<0.010	<0.010	06/27/02	MLH	EPA7060
Barium, mg/l	<0.500	0.646	1.547	<0.500	<0.500	06/24/02	LFJ	EPA6010B
Cadmium, mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	06/30/02	MLH	EPA7131
Total Chromium, mg/l	<0.010	0.058				06/25/02	LFJ	EPA6010B
			<0.010			06/25/02	LFJ	EPA6010B
				0.029		07/01/02	LFJ	EPA6010B
					<0.010	06/25/02	LFJ	EPA6010B
Lead, mg/l	<0.010	<0.010	<0.010	0.017	<0.010	06/14/02	LFJ	EPA7421
Mercury, mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	06/19/02	LFJ	EPA7470
Selenium, mg/l	<0.020	<0.020	<0.020	<0.020	<0.020	07/01/02	MLH	EPA7740
Silver, mg/l	<0.010	<0.010	<0.010	<0.010	<0.010	06/24/02	LFJ	EPA6010B
Conductivity (at 25c), uMhos	2300	2200	4300	270	810	06/11/02	RJH	SM2510B
Temperature, °C	17	16	15	16	15	06/11/02	RJH	SM2550B
Static Water Level, Feet	27.49	26.16	13.47	7.53	7.25	06/11/02	RJH	
Well Depth, feet	80.54	40.30	31.17	17.30	16.32	06/11/02	RJH	

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RALEIGH , NC 27603

DATE COLLECTED: 06/11/02  
DATE REPORTED : 07/05/02

REVIEWED BY:

PARAMETERS	Monitoring Well #6T	Monitoring Well #10	Surface Water #1	Surface Water #2	Surface Water #3	Analysis Date	Analyst	Method Code
PH (field measurement), Units	7.1	7.0	Missing	7.7	6.5	06/11/02	RJH	EPA150.1
Arsenic, mg/l	<0.010	<0.010	Missing	<0.010	<0.010	06/27/02	MLH	EPA7060
Barium, mg/l	0.837	<0.500	Missing	<0.500	<0.500	06/24/02	LFJ	EPA6010B
Cadmium, mg/l	<0.001	<0.001	Missing	<0.001	<0.001	06/30/02	MLH	EPA7131
Total Chromium, mg/l	<0.010	<0.010	Missing			06/25/02	LFJ	EPA6010B
				0.234		07/01/02	LFJ	EPA6010B
Lead, mg/l	<0.010	<0.010	Missing	0.014	<0.010	06/25/02	LFJ	EPA6010B
Mercury, mg/l	<0.001	<0.001	Missing	<0.001	<0.001	06/19/02	LFJ	EPA7470
Selenium, mg/l	<0.020	<0.020	Missing	<0.020	<0.020	07/01/02	MLH	EPA7740
Silver, mg/l	<0.010	<0.010	Missing	<0.010	<0.010	06/24/02	LFJ	EPA6010B
Conductivity (at 25c), uMhos	3700	620	Missing	140	120	06/11/02	RJH	SM2510B
Temperature, °C	19	16	Missing	20	21	06/11/02	RJH	SM2550B
Static Water Level, Feet	19.47	14.36				06/11/02	RJH	
Well Depth, feet	47.32	20.23				06/11/02	RJH	
EPA Method 8260B Volatiles			Missing			06/11/02		

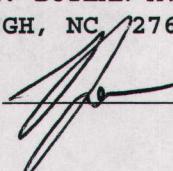
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RALEIGH, NC 27603

REVIEWED BY: 

CLIENT ID: 6011  
ANALYST: CMT  
DATE COLLECTED: 06/11/02 Page: 1  
DATE ANALYZED: 06/13/02  
DATE REPORTED: 07/05/02

VOLATILE ORGANICS  
EPA METHOD 8260B

PARAMETERS, ug/l	Monitoring Well #1	Monitoring Well #2T	Monitoring Well #3	Monitoring Well #4	Monitoring Well #5
1. Chloromethane	<10.00	<10.00	<10.00	<10.00	<10.00
2. Vinyl Chloride	<10.00	<10.00	<10.00	<10.00	<10.00
3. Bromomethane	<10.00	<10.00	<10.00	<10.00	<10.00
4. Chloroethane	<10.00	<10.00	<10.00	<10.00	<10.00
5. Trichlorofluoromethane	<5.00	<5.00	<5.00	<5.00	<5.00
6. 1,1-Dichloroethene	<5.00	<5.00	<5.00	<5.00	<5.00
7. Acetone	<100.00	<100.00	<100.00	<100.00	<100.00
8. Iodomethane	<10.00	<10.00	<10.00	<10.00	<10.00
9. Carbon Disulfide	<100.00	<100.00	<100.00	<100.00	<100.00
10. Methylene Chloride	<10.00	<10.00	<10.00	<10.00	<10.00
11. trans-1,2-Dichloroethene	<5.00	<5.00	<5.00	<5.00	<5.00
12. 1,1-Dichloroethane	<5.00	<5.00	<5.00	<5.00	<5.00
13. Vinyl Acetate	<50.00	<50.00	<50.00	<50.00	<50.00
14. Cis-1,2-Dichloroethene	<5.00	<5.00	<5.00	<5.00	<5.00
15. 2-Butanone	<100.00	<100.00	<100.00	<100.00	<100.00
16. Bromochloromethane	<5.00	<5.00	<5.00	<5.00	<5.00
17. Chloroform	<5.00	<5.00	<5.00	<5.00	<5.00
18. 1,1,1-Trichloroethane	<5.00	<5.00	<5.00	<5.00	<5.00
19. Carbon Tetrachloride	<5.00	<5.00	<5.00	<5.00	<5.00
20. Benzene	<5.00	<5.00	<5.00	<5.00	<5.00
21. 1,2-Dichloroethane	<5.00	<5.00	<5.00	<5.00	<5.00
22. Trichloroethene	<5.00	<5.00	<5.00	<5.00	<5.00
23. 1,2-Dichloropropane	<5.00	<5.00	<5.00	<5.00	<5.00
24. Bromodichloromethane	<5.00	<5.00	<5.00	<5.00	<5.00
25. Cis-1,3-Dichloropropene	<5.00	<5.00	<5.00	<5.00	<5.00
26. 4-Methyl-2-Pentanone	<50.00	<50.00	<50.00	<50.00	<50.00
27. Toluene	<5.00	<5.00	<5.00	<5.00	<5.00
28. trans-1,3-Dichloropropene	<5.00	<5.00	<5.00	<5.00	<5.00
29. 1,1,2-Trichloroethane	<5.00	<5.00	<5.00	<5.00	<5.00
30. Tetrachloroethene	<5.00	<5.00	<5.00	<5.00	<5.00
31. 2-Hexanone	<50.00	<50.00	<50.00	<50.00	<50.00
32. Dibromochloromethane	<5.00	<5.00	<5.00	<5.00	<5.00
33. 1,2-Dibromoethane	<5.00	<5.00	<5.00	<5.00	<5.00
34. Chlorobenzene	<5.00	<5.00	<5.00	<5.00	<5.00
35. 1,1,1,2-Tetrachloroethane	<5.00	<5.00	<5.00	<5.00	<5.00
36. Ethylbenzene	<5.00	<5.00	<5.00	<5.00	<5.00
37. Xylenes	<5.00	<5.00	<5.00	<5.00	<5.00
38. Dibromomethane	<10.00	<10.00	<10.00	<10.00	<10.00
39. Styrene	<5.00	<5.00	<5.00	<5.00	<5.00
40. Bromoform	<5.00	<5.00	<5.00	<5.00	<5.00
41. 1,1,2,2-Tetrachloroethane	<5.00	<5.00	<5.00	<5.00	<5.00
42. 1,2,3-Trichloropropane	<15.00	<15.00	<15.00	<15.00	<15.00
43. 1,4-Dichlorobenzene	<5.00	<5.00	<5.00	<5.00	<5.00
44. 1,2-Dichlorobenzene	<5.00	<5.00	<5.00	<5.00	<5.00
45. 1,2-Dibromo-3-Chloropropane	<25.00	<25.00	<25.00	<25.00	<25.00
46. Acrylonitrile	<200.00	<200.00	<200.00	<200.00	<200.00
47. trans-1,4-Dichloro-2-Butene	<100.00	<100.00	<100.00	<100.00	<100.00

# Environment 1, Incorporated

Drinking Water ID: 37715  
Wastewater ID: 10

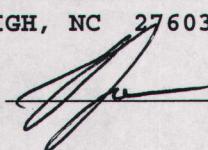
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RALEIGH, NC 27603

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ANALYST: CMT  
DATE COLLECTED: 06/11/02 Page: 2  
DATE ANALYZED: 06/13/02  
DATE REPORTED: 07/05/02

REVIEWED BY: 

VOLATILE ORGANICS  
EPA METHOD 8260B

PARAMETERS, ug/l	Monitoring Well #6T	Monitoring Well #10	Surface Water #2	Surface Water #3	Trip Blank
1. Chloromethane	<10.00	<10.00	<10.00	<10.00	<10.00
2. Vinyl Chloride	<10.00	<10.00	<10.00	<10.00	<10.00
3. Bromomethane	<10.00	<10.00	<10.00	<10.00	<10.00
4. Chloroethane	<10.00	<10.00	<10.00	<10.00	<10.00
5. Trichlorofluoromethane	<5.00	<5.00	<5.00	<5.00	<5.00
6. 1,1-Dichloroethene	<5.00	<5.00	<5.00	<5.00	<5.00
7. Acetone	<100.00	<100.00	<100.00	<100.00	<100.00
8. Iodomethane	<10.00	<10.00	<10.00	<10.00	<10.00
9. Carbon Disulfide	<100.00	<100.00	<100.00	<100.00	<100.00
10. Methylene Chloride	<10.00	<10.00	<10.00	<10.00	<10.00
11. trans-1,2-Dichloroethene	<5.00	<5.00	<5.00	<5.00	<5.00
12. 1,1-Dichloroethane	<5.00	<5.00	<5.00	<5.00	<5.00
13. Vinyl Acetate	<50.00	<50.00	<50.00	<50.00	<50.00
14. Cis-1,2-Dichloroethene	<5.00	<5.00	<5.00	<5.00	<5.00
15. 2-Butanone	<100.00	<100.00	<100.00	<100.00	<100.00
16. Bromochloromethane	<5.00	<5.00	<5.00	<5.00	<5.00
17. Chloroform	<5.00	<5.00	<5.00	<5.00	<5.00
18. 1,1,1-Trichloroethane	<5.00	<5.00	<5.00	<5.00	<5.00
19. Carbon Tetrachloride	<5.00	<5.00	<5.00	<5.00	<5.00
20. Benzene	<5.00	<5.00	<5.00	<5.00	<5.00
21. 1,2-Dichloroethane	<5.00	<5.00	<5.00	<5.00	<5.00
22. Trichloroethene	<5.00	<5.00	<5.00	<5.00	<5.00
23. 1,2-Dichloropropane	<5.00	<5.00	<5.00	<5.00	<5.00
24. Bromodichloromethane	<5.00	<5.00	<5.00	<5.00	<5.00
25. Cis-1,3-Dichloropropene	<5.00	<5.00	<5.00	<5.00	<5.00
26. 4-Methyl-2-Pentanone	<50.00	<50.00	<50.00	<50.00	<50.00
27. Toluene	<5.00	<5.00	<5.00	<5.00	<5.00
28. trans-1,3-Dichloropropene	<5.00	<5.00	<5.00	<5.00	<5.00
29. 1,1,2-Trichloroethane	<5.00	<5.00	<5.00	<5.00	<5.00
30. Tetrachloroethene	<5.00	<5.00	<5.00	<5.00	<5.00
31. 2-Hexanone	<50.00	<50.00	<50.00	<50.00	<50.00
32. Dibromochloromethane	<5.00	<5.00	<5.00	<5.00	<5.00
33. 1,2-Dibromoethane	<5.00	<5.00	<5.00	<5.00	<5.00
34. Chlorobenzene	<5.00	<5.00	<5.00	<5.00	<5.00
35. 1,1,1,2-Tetrachloroethane	<5.00	<5.00	<5.00	<5.00	<5.00
36. Ethylbenzene	<5.00	<5.00	<5.00	<5.00	<5.00
37. Xylenes	<5.00	<5.00	<5.00	<5.00	<5.00
38. Dibromomethane	<10.00	<10.00	<10.00	<10.00	<10.00
39. Styrene	<5.00	<5.00	<5.00	<5.00	<5.00
40. Bromoform	<5.00	<5.00	<5.00	<5.00	<5.00
41. 1,1,2,2-Tetrachloroethane	<5.00	<5.00	<5.00	<5.00	<5.00
42. 1,2,3-Trichloropropane	<15.00	<15.00	<15.00	<15.00	<15.00
43. 1,4-Dichlorobenzene	<5.00	<5.00	<5.00	<5.00	<5.00
44. 1,2-Dichlorobenzene	<5.00	<5.00	<5.00	<5.00	<5.00
45. 1,2-Dibromo-3-Chloropropane	<25.00	<25.00	<25.00	<25.00	<25.00
46. Acrylonitrile	<200.00	<200.00	<200.00	<200.00	<200.00
47. trans-1,4-Dichloro-2-Butene	<100.00	<100.00	<100.00	<100.00	<100.00

**Environment 1, Inc.**  
P.O. Box 7085, 114 Oak

P.O. Box 7085, 114 Oakmont Dr.  
Greenville, NC 27858

**CHAIN OF CUSTODY RECORD**

Phone (252) 756-6208 • Fax (252) 756-0633

**CLIENT:** 6011 Red Rock Landfill (C&D)  
**CERTIS JONES LANDFILL (C&D)**  
MS. JOAN SMYTH  
G.N. RICHARDSON & ASSOCIATES  
425 N. BOYLAN AVENUE  
RALEIGH NC 27603

(919) 828-0577

Instructions for completing this form are on the reverse side.

Sampler must place a "C" for composite sample or a "G" for Grab sample in the blocks above for each parameter requested

68482